Sheet (3) – supplementary

1. What determines the bandwidth of low pass filter?

   The critical frequency determines the bandwidth.

2. How are the Q and Bandwidth of a band-pass filter related? Explain how selectivity is affected by the Q of a filter?

   Q and *BW* are inversely related. The higher the *Q*, the better the selectivity, and vice

3. Explain how Butterworth, Chebyshev, and Bessel response filer differ?

   Butterworth is very flat in the passband and has a −20 dB/decade/pole roll-off. Chebyshev has ripples in the passband and has greater than −20 dB/decade/pole roll-off. Bessel has a linear phase characteristic and less than −20 dB/decade/pole roll-off.

4. What determine the response characteristic of a filter?

   The damping factor

5. Name the basic parts of an active filter.

   Frequency-selective circuit, gain element, and negative feedback circuit are the parts active filter.

6. How many poles does a second-order low-pass filter have? How many resistors and how many capacitors are used in the frequency-selective circuit?

   A second-order filter has two poles. Two resistors and two capacitors make up the frequency-selective circuit.

7. What is the primary purpose of cascading low-pass filters?

   Cascading increases the roll-off rate.

8. How does a high-pass sallen-key filter differ from the low-pass configuration?

   The positions of the *R*s and *C*s in the frequency-selective circuit are opposite for low-pass and high-pass configurations.

9. To increase the critical frequency of a high-pass filter, would you increase or decrease the resistor values?

Decrease the R values to increase f_c.

10. If three two-pole high-pass filters and one single-pole high-pass filter are cascaded, what is the resulting roll-off?

−140 dB/decade

11. What determine the selectivity in a band-pass filter?

Q determines selectivity.

12. One filter has a Q=5 and another has a Q=25. Which has the narrower bandwidth?

Q = 25. Higher Q gives narrower BW.

13. List the active elements that make up a state-variable filter.

A summing amplifier and two integrators make up a state-variable filter.

14. List the active elements that make up a biquad filter.

An inverting amplifier and two integrators make up a biquad filter.

15. How does a band-stop response differ from a band-pass response?

A band-stop rejects frequencies within the stopband. A band-pass passes frequencies within the passband.

16. How is a state-variable band-pass filter converted to a band-stop filter?

The low-pass and high-pass outputs are summed.

Good Luck

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